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ABSTRACT

The 1978 Wisconsin assessment program, involving students in grades 4, 8, and 12, focused upon: (1) state-developed tests referenced to state objectives for computation and everyday money and measurement skills; (2) the Comprehensive Tests of Basic Skills: mathematics, reading, and language; (3) comparison of results of the 1976, 1977, and 1978 assessment; and (4) relationship of attitudes toward mathematics and previous training to scores on the state-developed tests (grades 8 and 12 only). Fourth graders averaged above the 80th percentile in all areas of the state-developed tests; 8th grade students averaged between 51 and 90% correct; and seniors averaged between 60 and 95% correct. Both seniors and eighth graders had difficulty with fractions. For the third consecutive year, CTBS scores remained above the national norm. Although there was little variation on the state tests for all three grades, the 1978 CTBS scores of grades 4 and 8 declined and were similar to those of 1976. Attitudes toward mathematics were positively related to scores on the state test and to extent of post training. Both eighth and twelfth graders generally felt that their courses were applicable to everyday situations. (CP)

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REPORT: 1978 WISCONSIN PUPIL ASSESSMENT PROGRAM

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INTRODUCTION

In November of 1977 a sample of approximately 15,000 public school students participated in the statewide Assessment Program. There were three specific goals:

- -to determine student ability in terms of selected mathematics skills;
- -to determine how Wisconsin students compare nationally in mathematics, reading, and language;
- -to determine any significant increases or decreases in student performance when compared to the 1976 and 1977 test results.

To accomplish the first goal, Wisconsin educators identified a set of mathematics objectives or skills that students would be expected to achieve at grades 4, 8, and 12 (see Appendix). Test items were developed to measure each objective.

Fourth grade students were tested in six mathematics domains; eighth and twelfth grade students were tested in seven. The various test domains are shown in Table 1. Approximately 10,000 students took the objective-referenced tests.

Table 1

DOMAINS ON THE OBJECTIVE-REFERENCED TESTS

Fourth Grade	Eighth and Twelfth Grades
Computation	Computation
Addition	Addition
Subtraction	Subtraction
Multiplication	Multiplication
Division	Division
	Proportion & Percent
Applications	Applications
Money Application	Money Application
Measurement	Measurement

To reach the second goal, determining how Wisconsin students compare nationally in mathematics, reading, and language, the Comprehensive Tests of Basic Skills (CTBS) was given to nearly 5,000 students. This test is produced by CTB/McGraw Hill and is specifically designed to compare individuals or groups with a national average.

A third goal of the Assessment Program is to report progress over a period of years. In 1976 and 1977 similar tests were given to random samples of fourth, eighth, and twelfth grade students. Part III reports the results on items common to the three test years.

PREFACE

The 1978 Wisconsin Pupil Assessment Report is part of the continuing effort by the Department of Public Instruction to provide the people of Wisconsin with information about how well students in the public schools perform important academic skills.

Test results of the Assessment Program provide the legislature, governor's office, and general citizenry of the state with:

- -information about how well Wisconsin public school students demonstrate important skills and knowledge,
- -information about how well Wisconsin public school students perform in comparison to the rest of the nation,
- -information over time that might indicate upward or downward trends in performance.

In addition, the Wisconsin Pupil Assessment Program provides materials and technical assistance to local school districts which voluntarily utilize the products and processes of the Assessment Program.

It is necessary to emphasize the importance of a systematic statewide assessment procedure with specific goals if we are to obtain valid and reliable information about the general status of educational achievement in Wisconsin public schools. Test results alleviate the need for drawing conclusions based solely on limited personal or anecdotal experiences.

The 1978 Assessment focused on reading, language, and mathematics. Samples of students at grades 4, 8, and 12 were given an objective-referenced test in mathematics and also national norm-referenced tests in reading, language, and mathematics.

The tests used by the Wisconsin Pupil Assessment Program are multiple choice in design and reflect only a portion of the school curriculum. Scores from a single test cannot judge the adequacy of the total educational program. No attempt has been made to test the upper limits of what students have learned or such important abilities as creativity. Despite these limitations, the results provide a profile of how well Wisconsin public school students are able to perform important basic skills.

ORGANIZATION

This report is divided into four parts:

Part I -Results of the Objective-Referenced Mathematics Tests

Part II -Results of the Comprehensive Tests of Basic Skills

Part III -Comparison of Results on the 1976, 1977, and 1978 Assessments

Part IV -Relationship of Attitudes Toward Mathematics and Previous Training in Mathematics to Scores on the Objective-Referenced Mathematics Test

OVERVIEW OF RESULTS

1. On the objective-referenced mathematics test, fourth graders do best in addition, subtraction, and multiplication. The scores in division and the two applications domains, money and measurement, are somewhat lower.

2. In computation problems eighth grade students do best in whole numbers, followed by decimals and fractions. Students have the most difficulty with addition and subtraction of fractions.

3. Seniors do better than eighth graders on computation and applications problems, except for multiplication of fractions. This difference, however, is slight, and not significant.

4. Scores of fourth, eighth, and twelfth graders remain above the national average for the third year in a row. At this time there is no evident trend in test scores.

5. Eighth and twelfth grade students have positive attitudes about mathematics. In addition, they feel their mathematics courses prepare them to do math in everyday situations and to do the math required in other subjects.

6. Eighth and twelfth grade students who hold more positive views of mathematics tend to score higher on the objective-referenced mathematics test.

7. There is a relationship between the amount of mathematics taken by Wisconsin seniors and scores on the objective-referenced mathematics test: students with more mathematics do better.

PART I

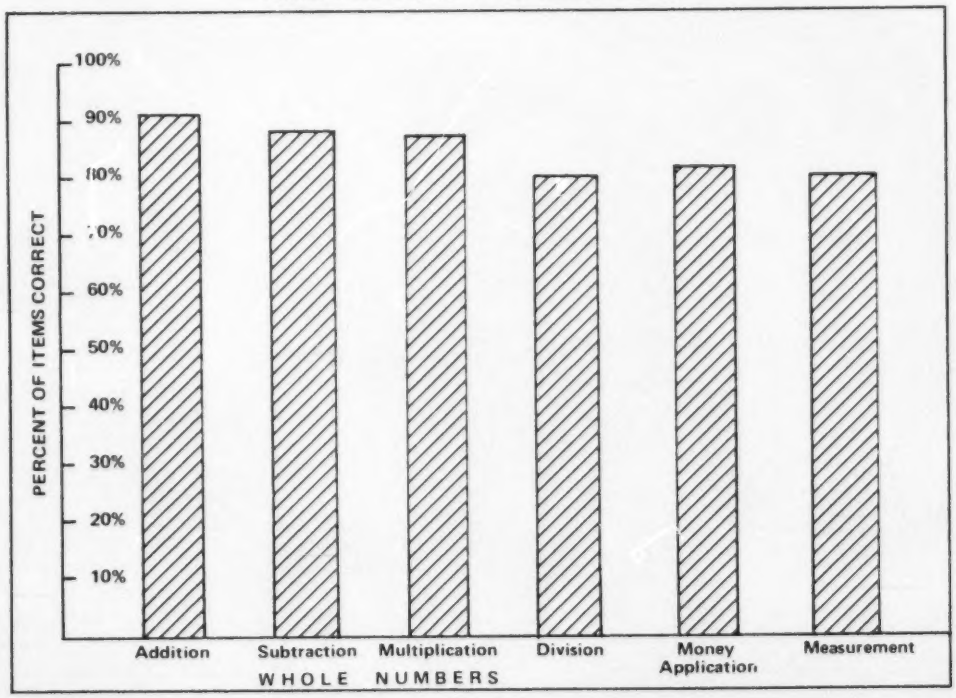
RESULTS OF THE OBJECTIVE-REFERENCED MATHEMATICS TEST

Fourth Grade

Fourth grade students do consistently well in addition (91% correct), subtraction (88% correct), and multiplication (87% correct). The scores in division and the two applications domains, money and measurement, are nearly the same: students average about 80% correct.

Figure 1

Percent of Items Correct in Mathematics: Grade 4



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Eighth Grade

In computation problems eighth grade students do best in whole numbers and decimals, followed by fractions.

In whole numbers eighth graders average 90% or better in addition, subtraction, and multiplication. The lowest scores are in division (72% correct).

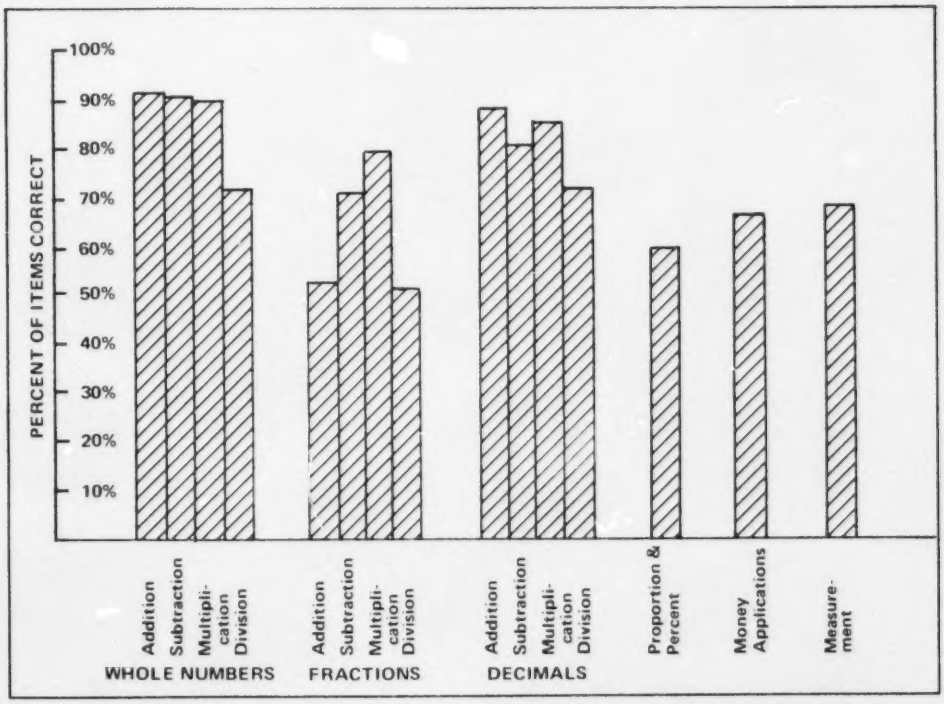
Use of decimals shows similar results; division is also the area of weakest performance.

Students have the most difficulty with fractions. This is especially true for addition and division, where the scores are 53% and 51% correct, respectively.

Eighth grade students average 60% correct on the proportion and percent items. In money and measurement applications ("story problems") students answered about two-thirds of the questions correctly.

Figure 2

Percent of Items Correct in Mathematics: Grade 8



Twelfth Grade

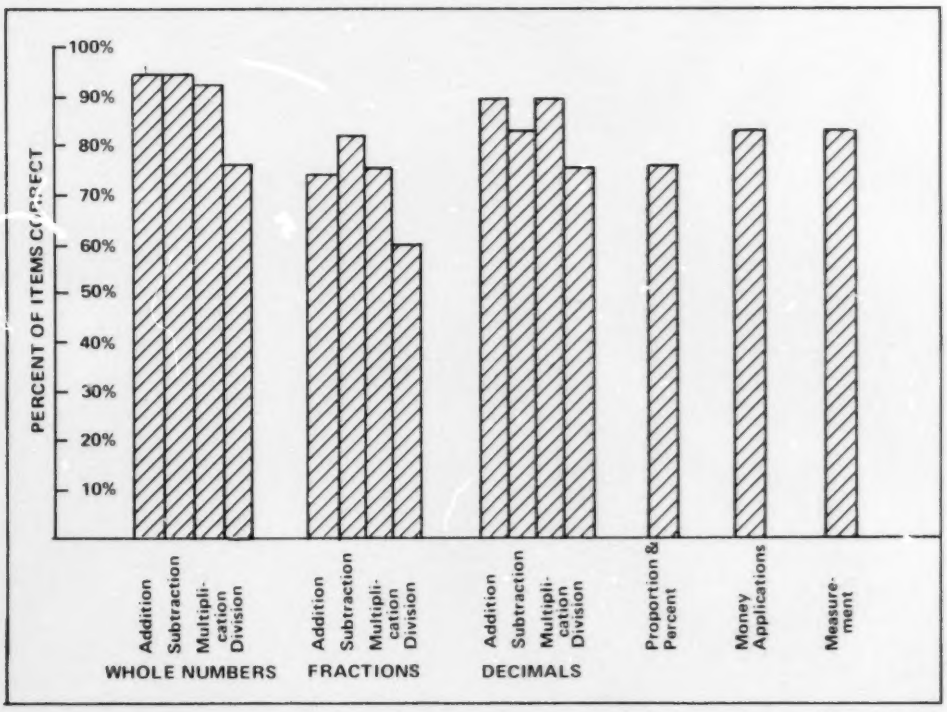
As is true with the eighth graders, seniors do best in whole numbers and decimals. The scores in fractions are lowest. However, there is an important difference between the performance scores of seniors and eighth graders in fractions; seniors score much higher.

In general, the scores of Wisconsin seniors are higher than those of the eighth graders on the computation problems. Seniors do better in all areas, especially in proportion and percent, where they average 16 percentage points higher. Eighth graders do better in multiplication of fractions. In this instance, they average three percentage points higher, a difference that is not significant.

Seniors also show higher scores in money and measurement applications. They average 16 percentage points higher than the eighth graders in each of these areas.

Figure 3

Percent of Items Correct in Mathematics: Grade 12



PART II

RESULTS OF THE COMPREHENSIVE TESTS OF BASIC SKILLS

The test instrument used to compare Wisconsin students with a national norm group is the Comprehensive Tests of Basic Skills (CTBS). Wisconsin students were tested in three subject areas: mathematics, reading, and language.

The national percentile scores of the CTBS serve as the basis for comparison. National percentile scores indicate how well the average Wisconsin student performs in relation to students of a similar grade across the country. Percentile scores range from 1 to 99. A percentile score of 60, for example, means that 60% of the national norm group scored lower on this test than the average Wisconsin student. It does not mean that the student answered 60% of the questions correctly.

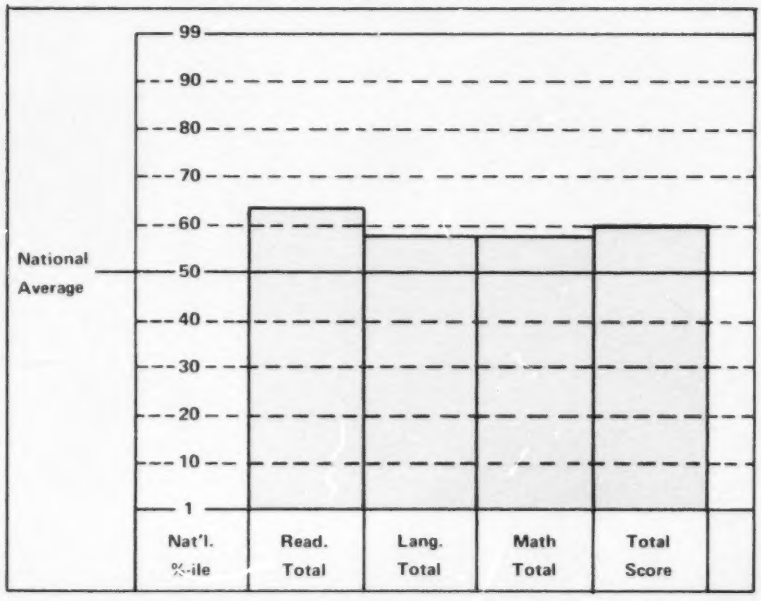
In addition to presenting the average percentile scores, another method also is used to compare Wisconsin fourth, eighth, and twelfth grade students with national averages. Percentile scores are classified into three ranges: upper, middle, and lower. Nationally, 25% of all students score in the upper and lower ranges; 50% score in the middle range. The percentage of Wisconsin students falling in the various percentile ranges is presented for each grade level. This method of comparing Wisconsin students to the national norm group allows conclusions to be reached about the distribution pattern of Wisconsin students at the three grade levels.

Fourth Grade

Wisconsin fourth grade students compare very favorably with fourth graders across the nation in reading, language, and mathematics. As shown in Figure 4, they score at the 64th percentile in reading, and at the 58th percentiles in language and mathematics. The combined results, labeled "Total Score," indicate the overall performance of Wisconsin fourth graders is at the 60th percentile.

Figure 4

Mean Percentile Scores of Wisconsin Fourth Grade Students Versus National Average



The distribution of Wisconsin fourth grade students within the three percentile ranges also indicates a favorable performance level. For example, on the Total Score 31% of Wisconsin fourth graders place in the upper range. This is 6% more than is found nationally. Only 17% fall into the lower range. This is 8% less than is found nationally.

Table 2
Comparison of Wisconsin Fourth Grade Students With National Norms: Mathematics, Reading, and Language

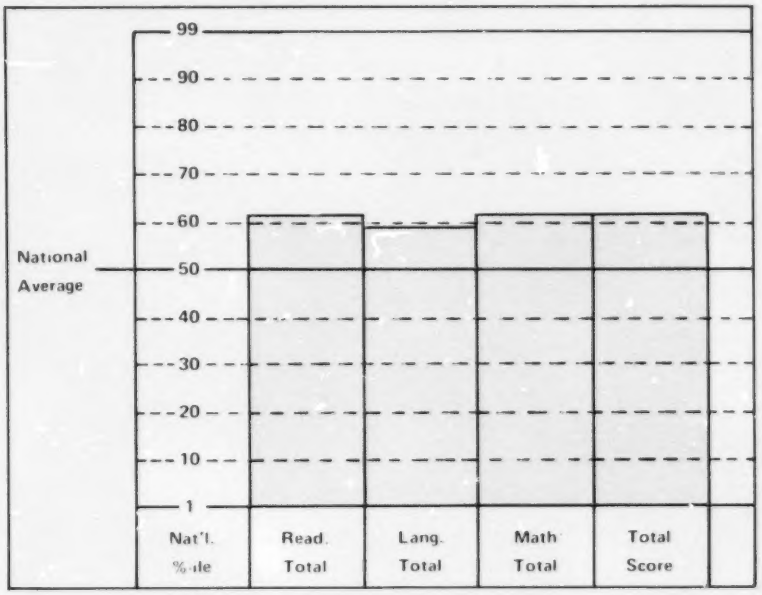
Percentile Range	National % of Students	Percent of Wisc. Students Falling in %-ile Range			
		Read.	Lang.	Math.	Total
Upper (76-99)	25	38	28	29	31
Middle (26-75)	50	45	53	51	52
Lower (1-25)	25	17	19	20	17
Totals	100%	100%	100%	100%	100%

Eighth Grade

Wisconsin eighth grade students do consistently well in mathematics, reading, and language. Their Total Score falls at the 62nd percentile, with scores on each subtest ranging from the 59th to 62nd percentiles.

Figure 5

Mean Percentile Scores of Wisconsin Eighth Grade Students Versus National Average



The excellence of Wisconsin eighth grade students is borne out in Table 3, which indicates they fall predominantly into the middle and upper ranges. On the Total Score only 13% place in the lower percentile range. This is 12% less than occurs nationally. In the upper range category we find 34% of the students, or 9% more than occurs nationally.

Table 3
Comparison of Wisconsin Eighth Grade Students With National Norms: Mathematics, Reading, and Language

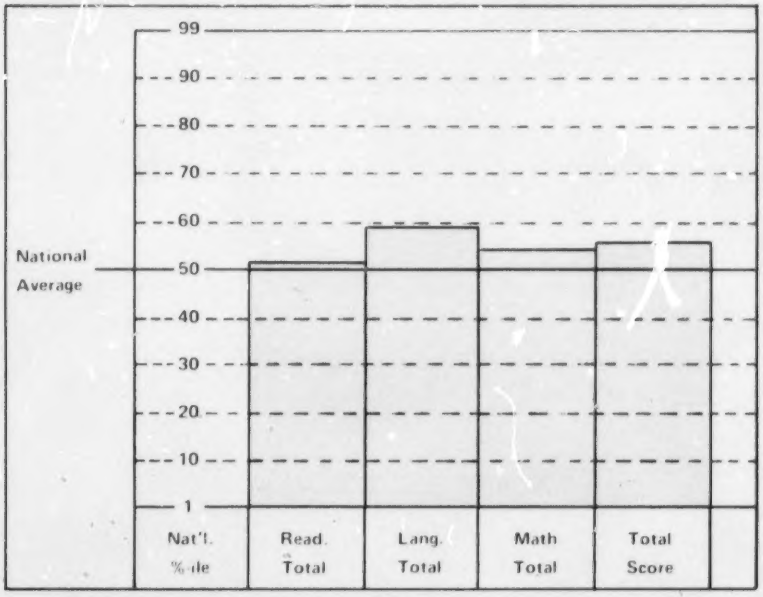
Percentile Range	National % of Students	Percent of Wisc. Students Falling in %-ile Range			
		Read.	Lang.	Math.	Total
Upper (76-99)	25	30	28	31	34
Middle (26-75)	50	57	60	48	53
Lower (1-25)	25	13	12	11	13
	100%	100%	100%	100%	100%

Twelfth Grade

Wisconsin seniors score above the national averages in reading, language, and mathematics. Scores fall at the 52nd percentile in reading, the 59th percentile in language, and the 54th percentile in mathematics. The Total Score is at the 56th percentile.

Figure 6

Mean Percentile Scores of Wisconsin Twelfth Grade Students Versus National Average



The distribution of scores of Wisconsin twelfth graders is favorable. More place in the upper and middle ranges than occurs nationally. For example, in the Total Score only 17% place in the lower percentile range. This is 8% less than occurs nationally.

Table 4
Comparison of Wisconsin Twelfth Grade Students With National Norms: Mathematics, Reading, and Language

Percentile Range	National % of Students	Percent of Wisc. Students Falling in %-ile Range			
		Read.	Lang.	Math.	Total
Upper (76-99)	25	26	29	27	27
Middle (26-75)	50	55	51	56	56
Lower (1-25)	25	19	20	17	17
	100%	100%	100%	100%	100%

PART III

COMPARISON OF RESULTS ON THE 1976, 1977, AND 1978 ASSESSMENTS

One important goal of the Wisconsin Pupil Assessment Program is to gather and report information on test results over a period of years. Part III compares the 1976, 1977, and 1978 results on identical items from the objective-referenced mathematics test and percentile scores on the Comprehensive Tests of Basic Skills (CTBS).

It is necessary to offer a word of caution. The data presented are from a three year period. Slight differences from one year to the next are to be expected; a longer period of time is needed to verify trends. For this reason, an increase or decrease of a few points should not be viewed with either optimism or pessimism. A change of perhaps five or six percentage points on the objective-referenced mathematics test, occuring over several years, would be indicative of significant change.

On the CTBS a change of perhaps three percentile points on one of the subtests would be significant. The Total Score would require a difference of approximately six percentile points.

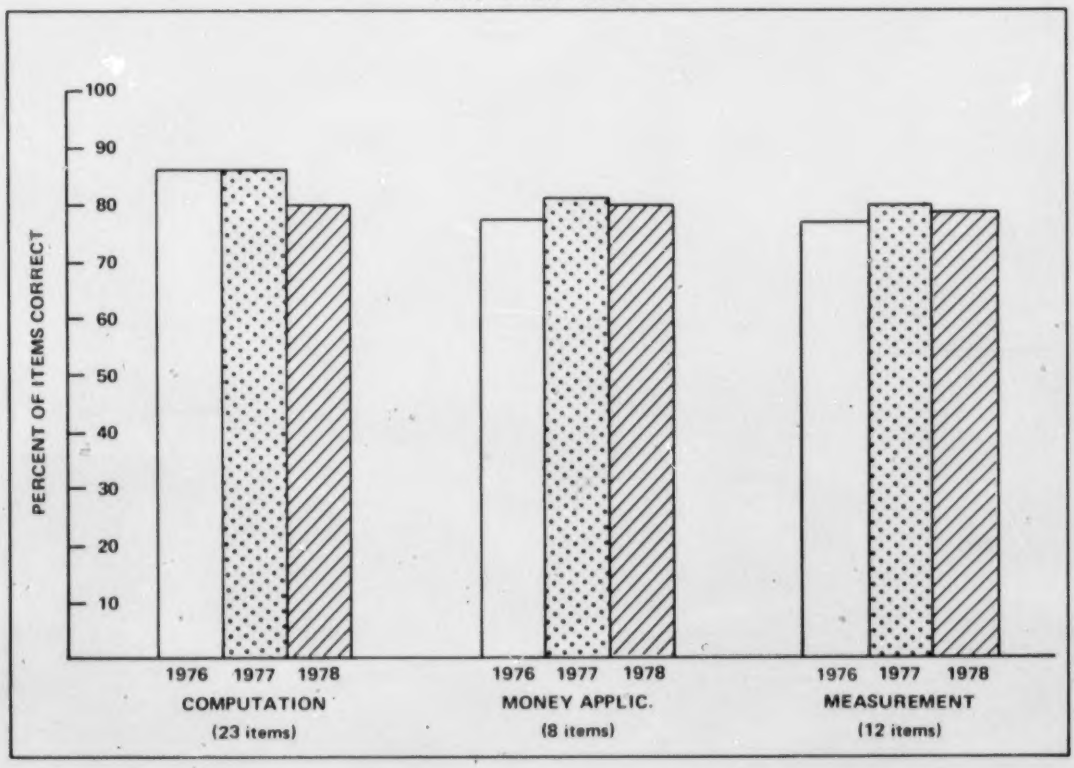
Comparison of Scores on the Objective-Referenced Tests

Fourth Grade

Scores of fourth grade students on the objective-referenced mathematics test are consistently high over the three test years. There are no significant differences in the averages on the various test domains.

Figure 7

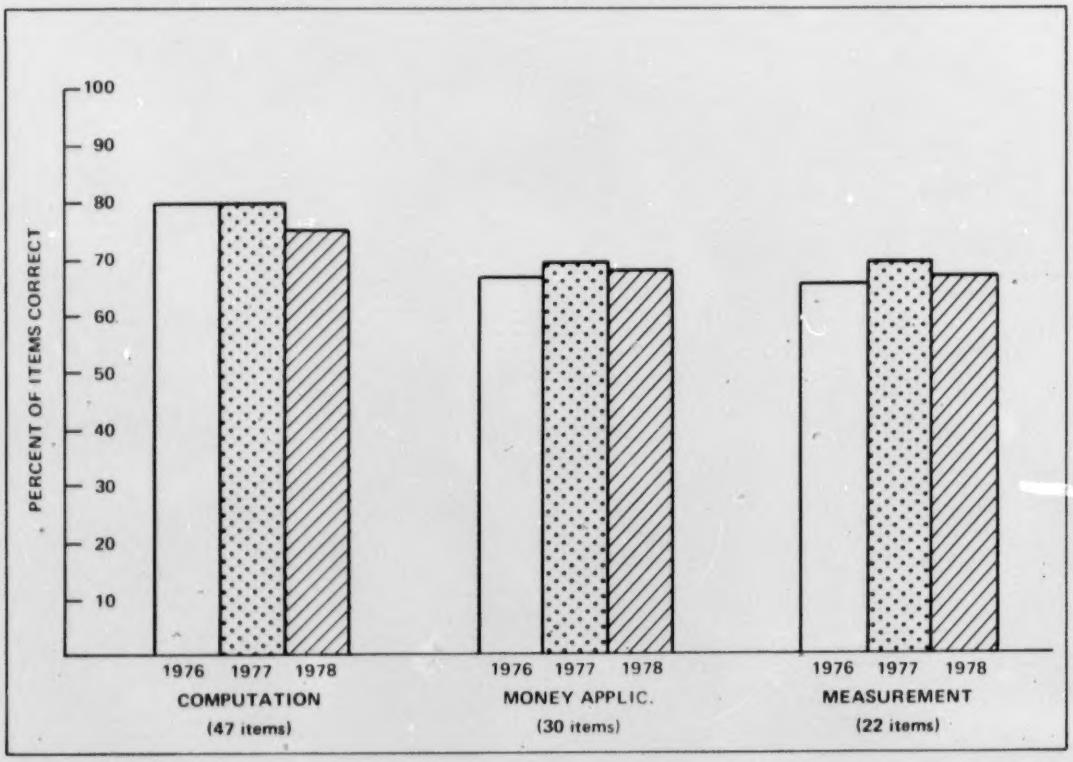
Percent of Items Correct on Mathematics Test: 1976, 1977, and 1978: Grade 4



Eighth Grade

Scores of Wisconsin eighth grade students present a pattern similar to that of fourth graders. Results on the objective-referenced mathematics test are consistent, showing little variation from 1976 to 1978.

Figure 8
Percent of Items Correct on Mathematics Test: 1976, 1977, and 1978: Grade 8

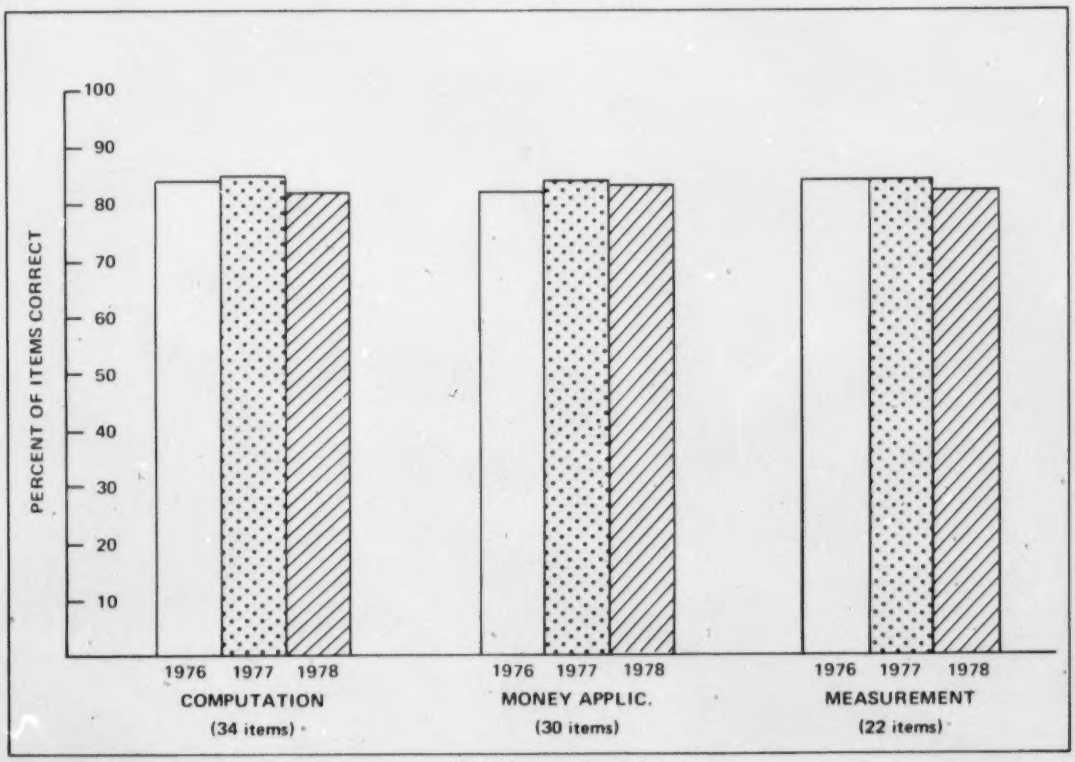


Twelfth Grade

Scores of twelfth grade students on the objective-referenced mathematics test show the least amount of variation among the three grade levels tested. Over the three year period the greatest difference for any of the mathematics domains is only three percentage points.

Figure 9

Percent of Items Correct on the Mathematics Test: 1976, 1977, and 1978: Grade 12



A Comment on CTBS Results

The measure or progress over time remains unclear after three years of testing, for no consistent trend has developed. Although there were gains in percentile scores on the CTBS between 1976 and 1977, it must be recognized that the scores for 1978 of the fourth and eighth grade groups are lower than those of 1977. The 1978 scores more closely approximate those of 1976.

Any interpretation of this data must be tentative, and suggested "causes," hypothetical. However, one possible explanation is that the 1977 fourth and eighth grade groups were exceptional, while the 1976 and 1978 groups were more typical.

Despite the inconsistency of the data, it is important to realize that the test scores of Wisconsin students remain above the national averages at all grade levels and in all test areas.

Comparison of Scores on the Comprehensive Tests of Basic Skills

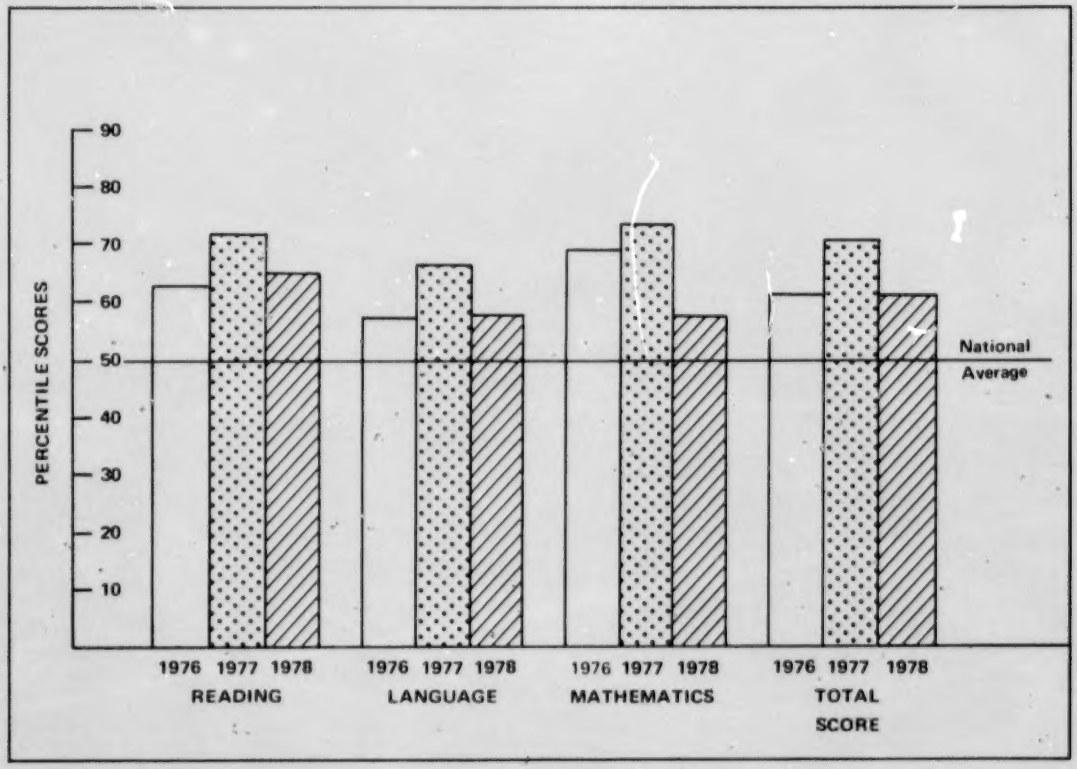
Fourth Grade

Fourth Grade scores on the CTBS show a varied pattern. As indicated in Figure 10,1977 was a peak year for each subject area. Scores in 1976 and 1978 are lower.

In each subject area over the three years Wisconsin fourth graders score above the national average.

Figure 10

Percentile scores on Reading, Language, and Mathematics sections of the CTBS, 1976, 1977, and 1978: Grade 4



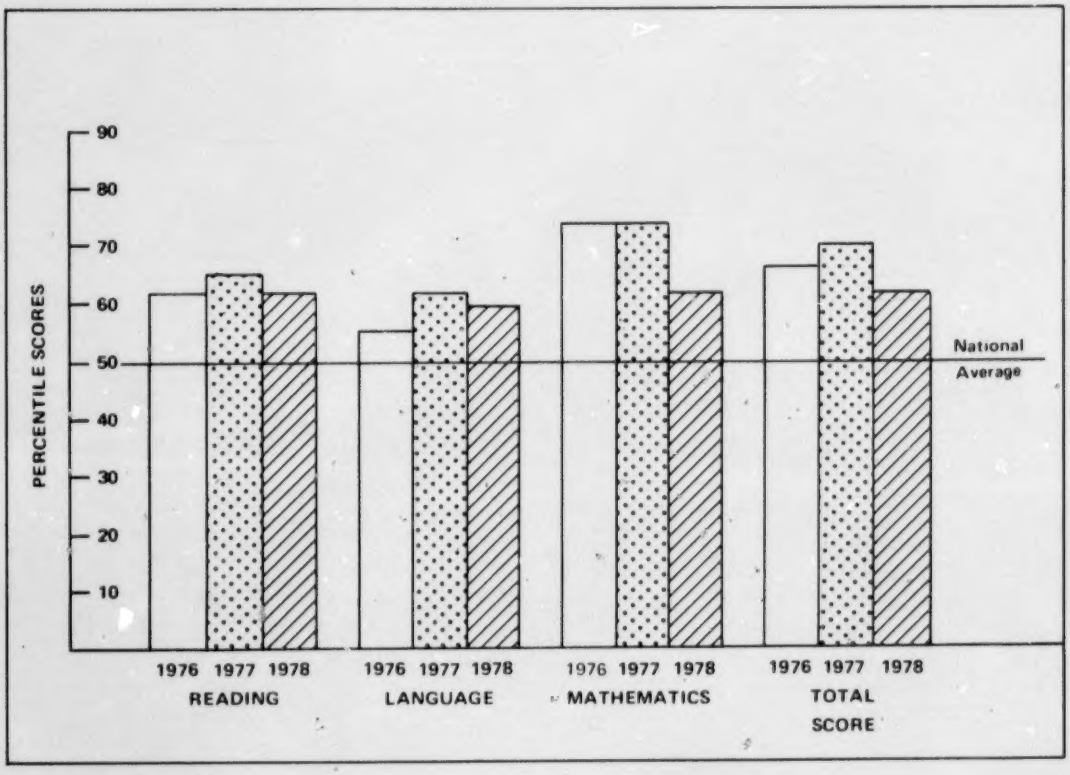
Eighth Grade

Analysis of eighth grade results on the CTBS indicates mixed trends among the subject areas tested. In reading, scores are consistent over the three years. Language scores in 1977 and 1978 are higher than those of 1976. In mathematics, the percentile score for 1978 is 12 percentile points lower than the scores for 1976 and 1977.

In each area over the three years Wisconsin eighth graders score significantly above the national average.

Figure 11

Percentile scores on Reading, Language, and Mathematics sections of the CTBS, 1976, 1977, and 1978: Grade 8

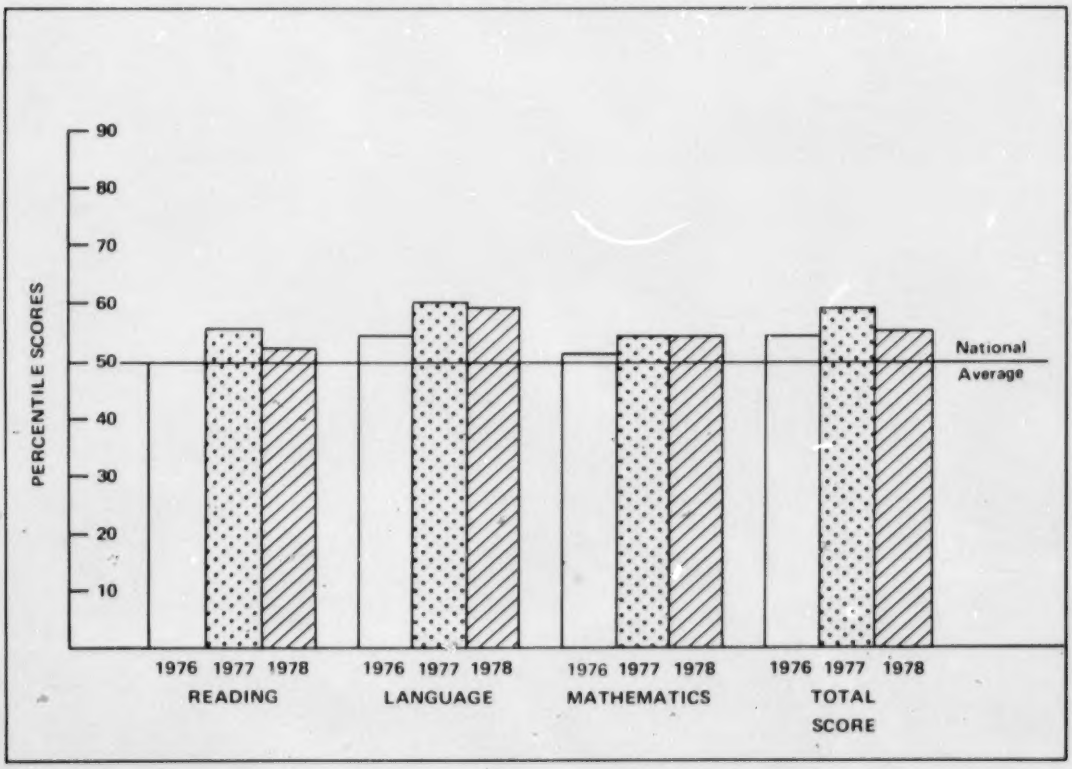


Twelfth Grade

Scores of twelfth grade students on the CTBS are higher in 1977 and 1978 than in 1976. For each of the three years, scores are at or above the national averages.

Figure 12

Percentile scores on Reading, Language, and Mathematics sections on the CTBS, 1976, 1977, and 1978: Grade 12



PART IV

RELATIONSHIP OF ATTITUDES TOWARD MATHEMATICS AND PREVIOUS TRAINING IN MATHEMATICS TO SCORES ON THE OBJECTIVE-REFERENCED MATHEMATICS TEST

Included on the 1978 eighth and twelfth grade objective-referenced mathematics test were three questions dealing with attitudes that students have toward mathematics. Seniors were asked to answer two additional questions about their previous training in mathematics. The five questions are as follows:

1. Compared to other courses you've taken, how do you feel about mathematics?

2. Have your mathematics courses prepared you to do the math required in other subjects?

3. Do you feel your mathematics courses have prepared you to use math in everyday situations? (for example, balancing a checkbook, making change, figuring sales tax, etc.).

4. When was the last year in school that you took a mathematics course? (seniors only).

5. Between the beginning of 9th grade and the end of this year I will have completed about _____ years of mathematics (seniors only).

Eighth Grade

Eighth grade students show a positive attitude toward mathematics. As shown in Table 5, 80% rate mathematics as either "one of my favorite subjects" or "about the same as other subjects."

It is important to point out that students rating mathematics in a more positive way score higher on the objective-referenced test. For example, those students rating mathematics as "one of my favorite subjects" average 78% correct in computation, whereas those who rate mathematics as "one of my least favorite subjects" average 63% correct.

Table 5
Comparison of the Percent Correct in Mathematics With Responses of Eighth Graders to the Question, "Compared to other courses you've taken, how do you feel about mathematics?"

Question	Student Responses to Question	Percent Correct	
		Computation	Applications
Compared to other courses you've taken, how do you feel about mathematics?	38% said it is "one of my favorite subjects," and they averaged...	78%	74%
	42% said it is "about the same as other subjects," and they averaged...	71%	65%
	20% said it is "one of my least favorite subjects," and they averaged...	63%	60%

Eighth graders also feel their mathematics courses have prepared them "to use math in everyday situations" (70% answer yes) and "to do math required in other subjects" (92% answer yes). As shown in Tables 6 and 7, students who answer yes to each of these questions score higher on the test than those who answer no.

Table 6
Comparison of the Percent Correct in Mathematics With Responses of Eighth Graders to the Question, "Do you feel your mathematics courses have prepared you to use math in everyday situations?"

Question	Student Responses to Question	Percent Correct	
		Computation	Applications
Do you feel your mathematics courses have prepared you to use math in everyday situations?	70% answered yes, and they averaged...	73%	70%
	8% answered no, and they averaged...	62%	56%
	22% answered not certain, and they averaged...	69%	63%

Table 7

Comparison of the Percent Correct in Mathematics With Responses of Eighth Graders to the Question, "Have your mathematics courses prepared you to do the math required in other subjects?"

Question	Student Responses to Question	Percent Correct	
		Computation	Applications
Have your mathematics courses prepared you to do the math required in other subjects?	92% answered yes, and they averaged...	74%	69%
	8% answered no, and they averaged...	62%	56%

Twelfth Grade

In contrast to eighth grade students, seniors hold a less positive view of mathematics. Whereas 20% of eighth graders rate mathematics as "one of my least favorite subjects," 36% of seniors respond in this way.

The relationship between the attitude one has toward mathematics and performance scores is similar to that noted for the eighth graders: students with more favorable attitudes score higher than those with less favorable attitudes.

Table 8
Comparison of the Percent Correct in Mathematics With Responses of Twelfth Graders to the Question, "Compared to other courses you've taken, how do you feel about mathematics?"

Question	Student Responses to Question	Percent Correct	
		Computation	Applications
Compared to other courses you've taken, how do you feel about mathematics?	31% said it is "one of my favorite subjects," and they averaged...	90%	90%
	33% said it is "about the same as other subjects," and they averaged...	82%	86%
	36% said it is "one of my least favorite subjects," and they averaged...	74%	79%

Tables 9 and 10 indicate that seniors feel their mathematics courses have prepared them "to do the math required in other subjects" (92% answer yes) and "to use math in everyday situations" (86% answer yes).

As has been noted previously, there is a relationship between how students feel about mathematics and their performance scores. Generally, a more positive response is associated with a higher percentage of correct answers.

Table 9
Comparison of the Percent Correct in Mathematics With Responses of Twelfth Graders to the Question, "Have your mathematics courses prepared you to do the math required in other subjects?"

Question	Student Responses to Question	Percent Correct	
		Computation	Applications
Have your mathematics courses prepared you to do the math required in other subjects?	92% answered yes, and they averaged...	84%	87%
	8% answered no, and they averaged...	70%	74%

Table 10

Comparison of the Percent Correct in Mathematics With Responses of Twelfth Graders to the Question, "Have your mathematics courses prepared you to do math in everyday situations?"

Question	Student Responses to Question	Percent Correct Computation	Percent Correct Applications
Do you feel your mathematics courses have prepared you to use math in everyday situations?	86% answered yes, and they averaged...	84%	87%
	5% answered no, and they averaged...	69%	74%
	9% answered not certain, and they averaged...	70%	72%

Two questions were asked seniors about their background in mathematics. The results are presented in Tables 11 and 12.

Among Wisconsin seniors, 35% were currently enrolled in a mathematics course at the time of the test (Table 11) Only 14% had as little as one year of high school mathematics.

The relationship between the amount of prior mathematics and scores on the mathematics test is significant. Students with the most recent exposure to mathematics do best on the test.

Table 11
Comparison of the Percent Correct in Mathematics With Responses of Twelfth Graders to the Question, "When was the last year in school that you took a mathematics course?"

Question	Student Responses to Question	Percent Correct	
		Computation	Applications
When was the last year in school that you took a mathematics course?	14% answered 9th grade, and they averaged...	67%	75%
	24% answered 10th grade, and they averaged...	78%	84%
	28% answered 11th grade, and they averaged...	82%	85%
	35% answered 12th grade, and they averaged...	88%	88%

Table 12 indicates that nearly one-half (43%) of Wisconsin seniors have had three or more years of high school mathematics. Only 23% have had less than 1½ years. Students with the most mathematics score highest on the test.

Table 12
Comparison of the Percent Correct in Mathematics With Responses of Twelfth Graders to the Question, "Between the beginning of 9th grade and the end of this school year, how many years of mathematics will you have completed?"

Question	Student Responses to Question	Percent Correct Computation	Percent Correct Applications
Between the beginning of 9th grade and the end of this school year, how many years of mathematics will you have completed?	3% answered 0-½ years, and they averaged...	59%	66%
	20% answered 1-1½ years, and they averaged...	71%	76%
	34% answered 2-2½ years, and they averaged...	81%	84%
	43% answered 3 or more years, and they averaged...	89%	90%

APPENDIX
OBJECTIVES ON THE OBJECTIVE-REFERENCED MATHEMATICS TEST

COMPUTATION

Whole Numbers
- -addition
- -subtraction
- -multiplication
- -division

Decimals
- -addition
- -subtraction
- -multiplication
- -division

Fractions
- -addition
- -subtraction
- -multiplication
- -division

Proportion & Percent
- -solve a simple proportion
- -compute what percent one whole number is of another
- -compute a given percent of a whole number

APPLICATIONS

Money Applications
- -determine the value of currency/coins
- -find change from a purchase
- -find total possible purchase
- -find total cost
- -find tax, tip or discount
- -find cost after discount or surcharge
- -find or compare unit price(s)
- -find difference in wages or savings (expressed in different units)
- -find time rate or earnings
- -find earnings over time
- -find pay after deductions, raise or overtime
- -balance a checkbook
- -balance living costs

Measurement Applications
- -find total area, length, weight, volume or time
- -find starting, ending or elapsed time
- -use a recipe
- -find average size, units or mph
- -compare temperatures, length, area, weight, or volume
- -read a ruler or odometer
- -read maps, charts, graphs
- -use a bus schedule